Space charge effects in 6D coolimg

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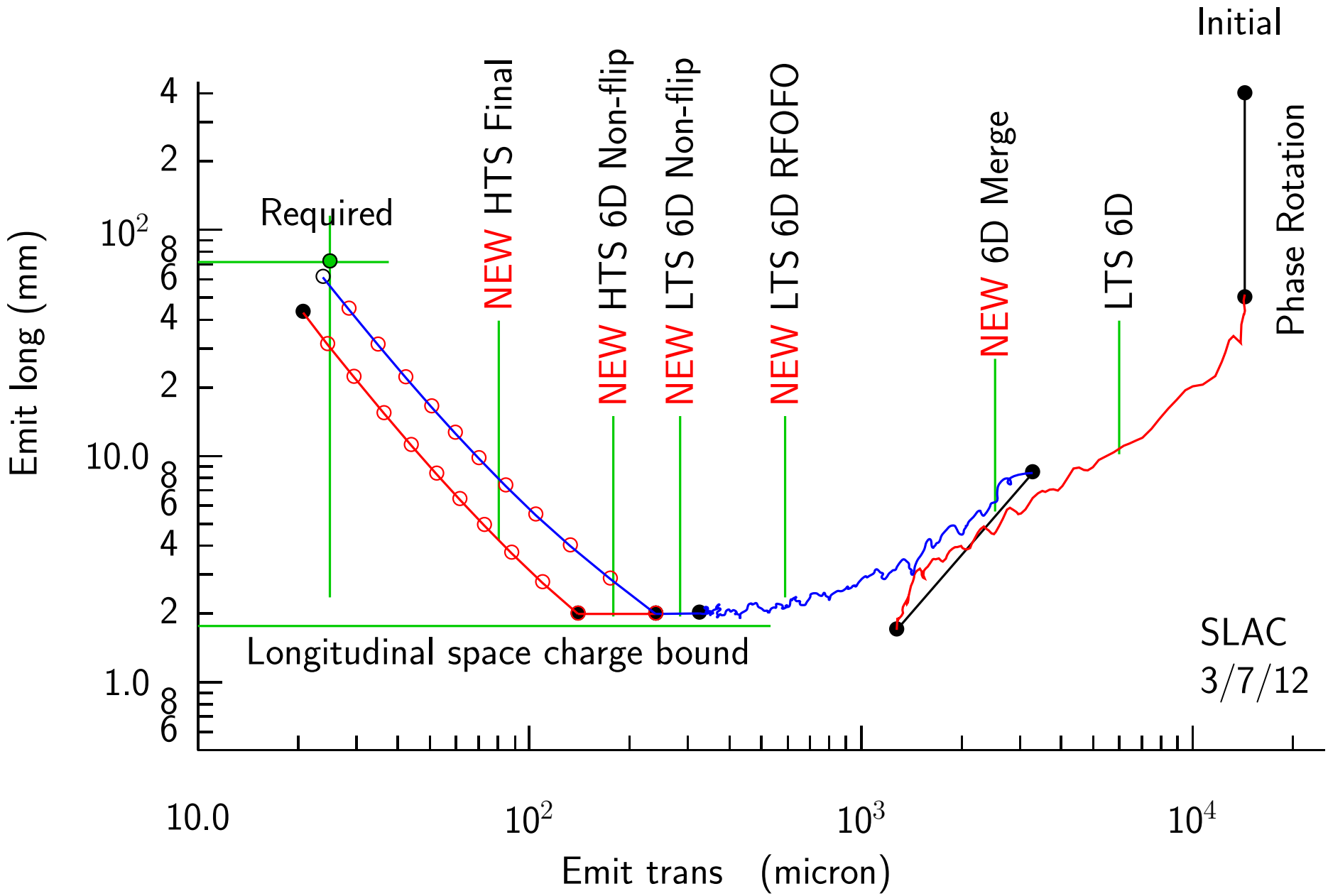
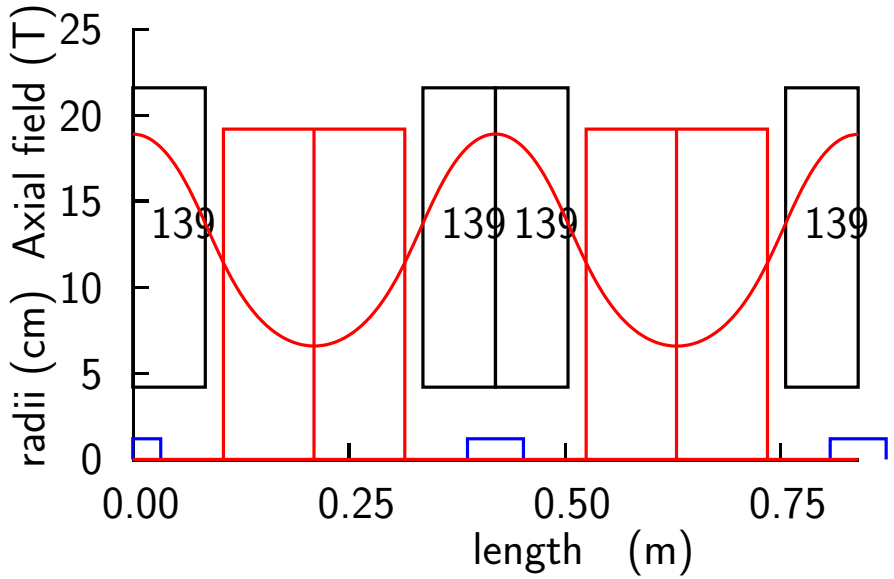
MAP Winter Meeting

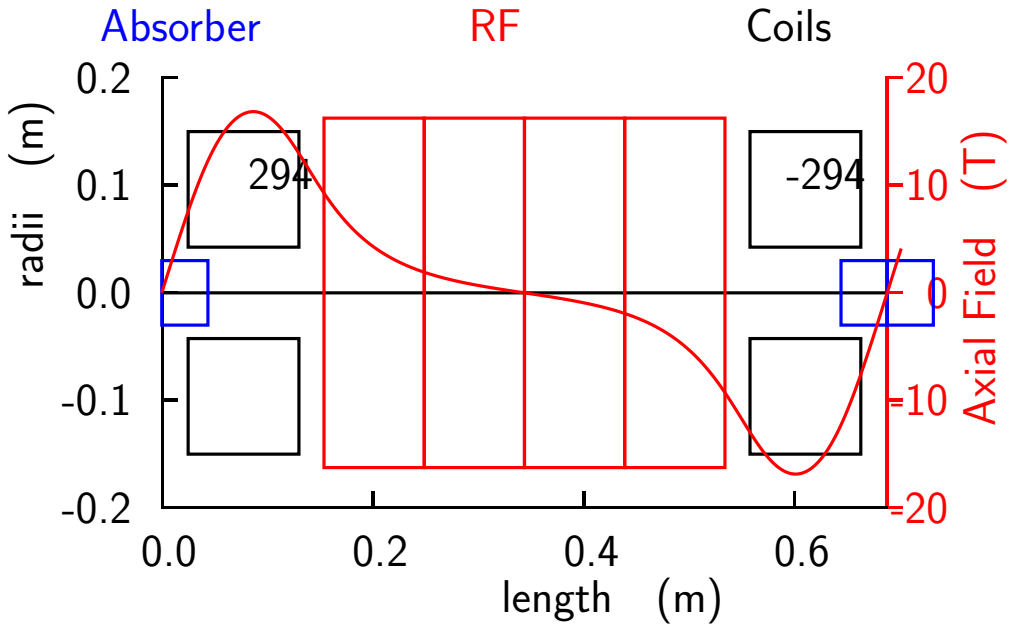
SLAC

3/4-8/12


Initial
Phase Rotation
LTS 6D
NEW 6D Merge
NEW LTS 6D RFOFO
NEW LTS 6D Non-flip
NEW HTS 6D Non-flip
NEW HTS Final
Required
Longitudinal space charge bound
SLAC
3/7/12
Emit long (mm)
Emit trans (micron)
4
2
10^2
8
6
4
2
10.0
8
6
4
2
1.0
8
6
10.0
10^2
10^3
10^4

Non-flip lattice allows 6D to lower $\epsilon_\perp$





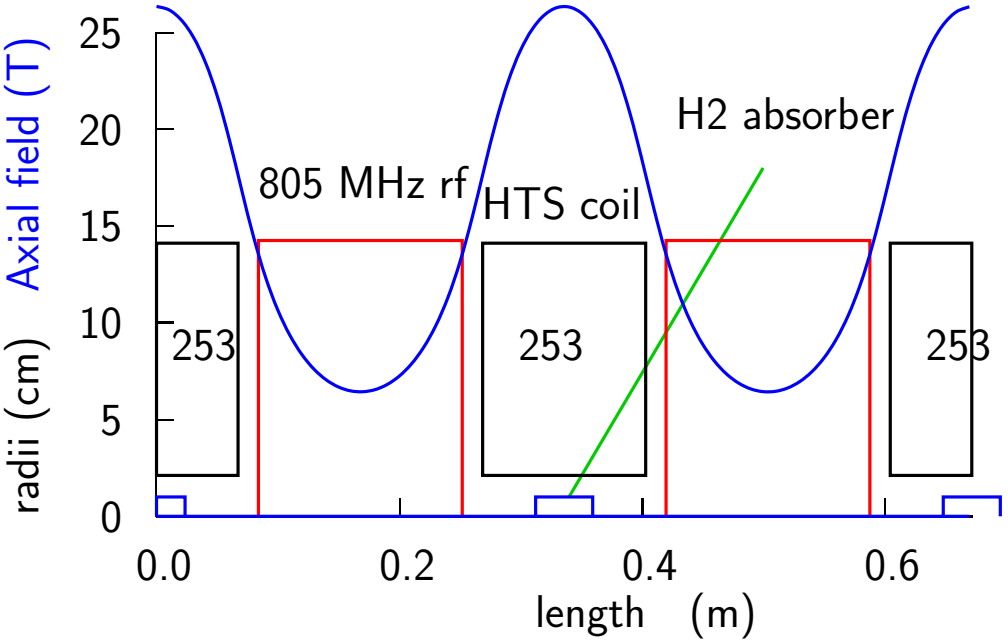
But

B(max) = 18 T
B(coil) = 12 T

cf last RFOFO

B(max) = 16 T
B(coil) = 6 T

We can do better with HTS coils



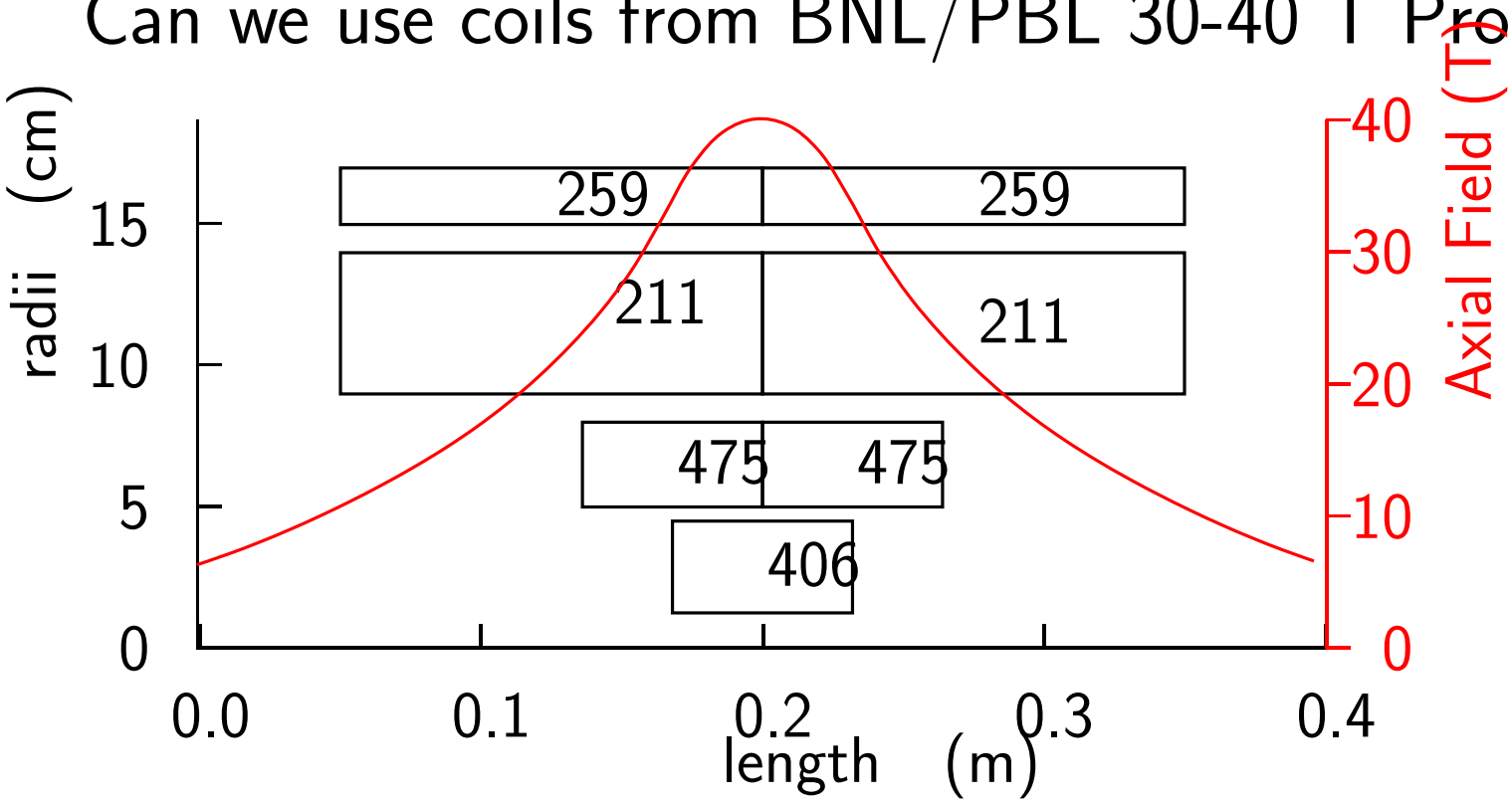
BUT

B(max)=26 T
B(coil)=14 T

There are significant gains if the rf will operate in such fields

Challenge: testing rf in such fields

Can we use coils from BNL/PBL 30-40 T Program?

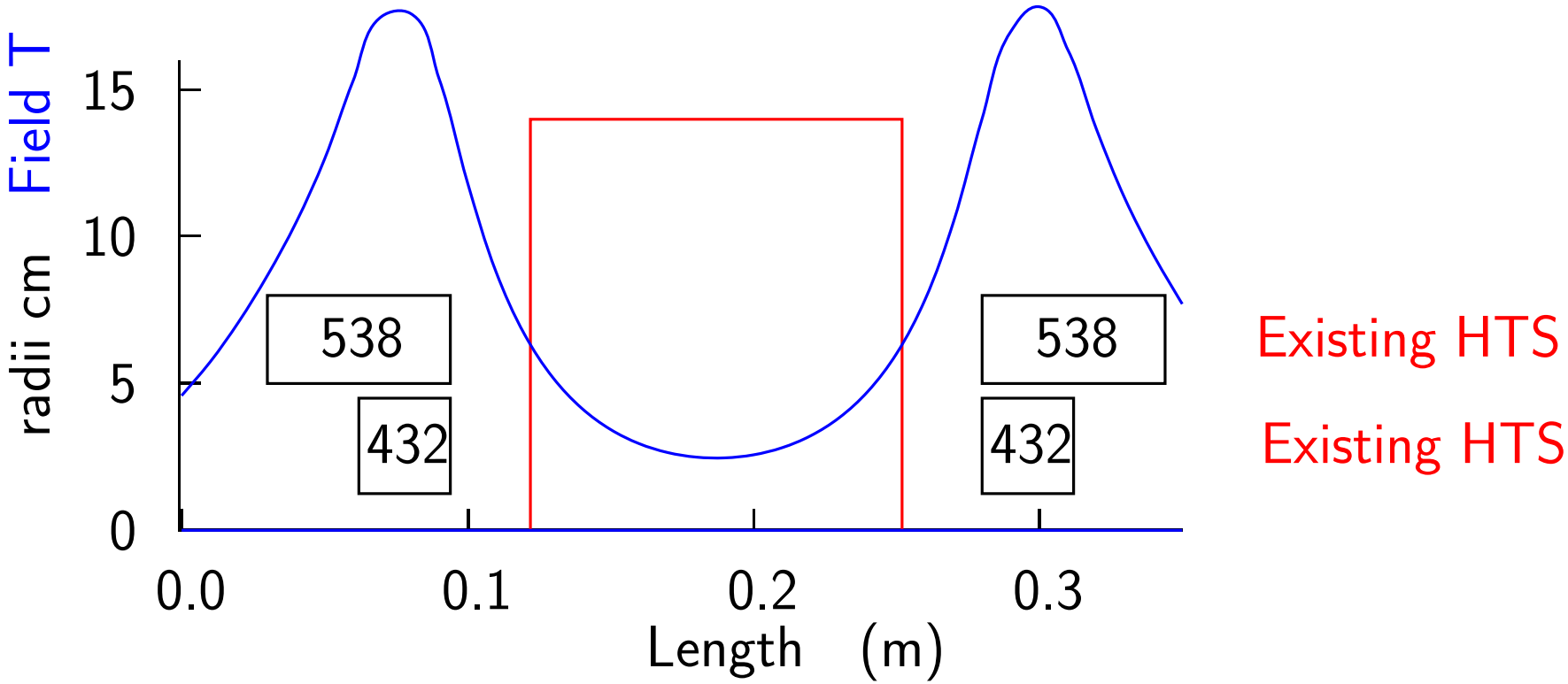


- The inner 3 HTS coils exist
- The outer Nb_3Sn coils are in Phase 1 design

A first experiment

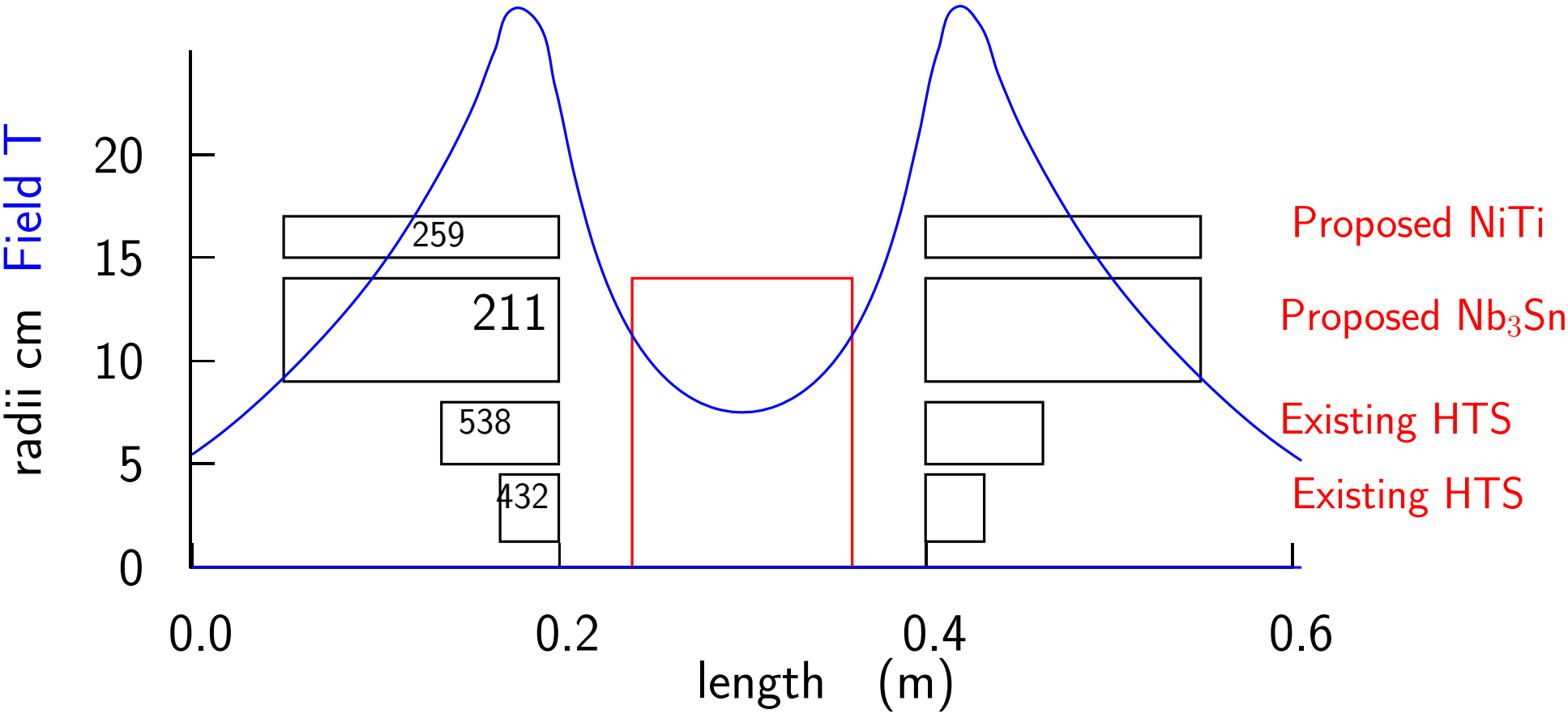
- If the Be cavity is coupled from the top:

- First exp could use existing YBCO coils
- Will require rf at 77 degrees and special cryostat
- Gives 6 T on the rf



Later experiment

- If the Phase II is approved, or MAP funds it, then we could use its Nb_3Sn coils to get fields of 12 T on the coils and a geometry almost exactly as proposed



Conclusion

- Current last RFOFO lattice has max field on coils of 6 T which nis more than Lab G magnet's
- And field geometry very differ4ent from that with Lab G magnet
- To avoid a probable space charge problem we are proposing a Non-flip lattice with 10 T fields on the rf
- With HTS, Non-flip lattices allow cooling to 20 μm or less, but with fields of 14 T on the coils

- If the Be cavity is coupled from the top,
- and using coils from the BNL/PBL 30-40 T program,
- we could do tests with the required field in the required geometry